Innovative
Current Sensor ICs
Allegro MicroSystems, LLC has developed a line of fully integrated Hall-effect current sensor ICs and Hall-effect linear ICs that provide highly accurate, low noise output voltage signals that are proportional to an applied AC or DC current. These current sensor ICs are in high volume production in many applications, including automotive HEV inverters and electronic power steering (EPS) systems, and in industrial and consumer inverters, compressors, and motors. Allegro current sensor ICs are also used in many power monitoring applications, such as computer blade servers and server power supplies.

Allegro’s proprietary fully integrated Hall-effect current sensor ICs employ advanced IC and packaging techniques for sensing current from 5 A to 200 A. For sensing beyond 200 A an Allegro current sensor linear IC can be used. Allegro current sensor ICs allow design engineers to use Hall-effect-based current sensor ICs in new applications where increased energy efficiency or new operating features are required.

Wherever current sensing is needed, an Allegro sensor IC can provide a solution.

### SIP Package 0 to >1000 A Sensor ICs

The Allegro family of single inline package (SIP) Hall-effect current sensor ICs is customer programmable for both offset and sensitivity. The temperature coefficient of both sensitivity and zero gauss offset voltage are factory trimmed to maintain an accurate output voltage over temperature.

These Hall linear ICs are packaged in a 1 mm thick KT package SIP that is often used in applications with a ferromagnetic core and are easily designed to sense currents above 1500 A.

See figure 1 illustration on back cover

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Supply Voltage (V)</th>
<th>Quiescent Output (V)</th>
<th>Typical Sensitivity (mV/G)</th>
<th>Output Bandwidth (kHz)</th>
<th>Temperature Ranges</th>
<th>Packages</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1360</td>
<td>4.5 to 5.5</td>
<td>Typ 10% or 50% Vcc</td>
<td>0.7 to 1.4 Programmable</td>
<td>50</td>
<td>L</td>
<td>KT</td>
<td>Factory programmed TC to 0%/°C</td>
</tr>
<tr>
<td>A1361</td>
<td>4.5 to 5.5</td>
<td>Typ 10% or 50% Vcc</td>
<td>1.4 to 4.5 Programmable</td>
<td>50</td>
<td>L</td>
<td>KT</td>
<td>Factory programmed TC to 0%/°C</td>
</tr>
<tr>
<td>A1362</td>
<td>4.5 to 5.5</td>
<td>Typ 10% or 50% Vcc</td>
<td>4.5 to 16 Programmable</td>
<td>50</td>
<td>L</td>
<td>KT</td>
<td>Factory programmed TC to 0%/°C</td>
</tr>
<tr>
<td>A1363</td>
<td>4.5 to 5.5</td>
<td>Typ 50% Vcc</td>
<td>0.6 to 14 Programmable</td>
<td>120</td>
<td>L</td>
<td>KT</td>
<td>Next generation factory programmed TC to 0%/°C</td>
</tr>
</tbody>
</table>

Temperature range codes: S = -20°C to 85°C, E = -40°C to 85°C, K = -40°C to 125°C, L = -40°C to 150°C

### High-Side Hot-Swap Hall-Effect Based Current Monitor IC

Allegro’s family of current monitor ICs combine Allegro’s Hall-effect current sense technology with a hot-swap controller resulting in a more efficient integrated controller for 12 V applications. The integrated current loop eliminates the need for a shunt resistor, and the low 1mOhm resistance also reduces the I²R losses in the power path. Devices include external hot-swap FET control with internal charge pump. It also includes user-selectable over-current protection and fault delay as well as short-circuit protection that disables the FET gate in less than 2 uS. Faults are also reported on a digital fault pin and can be reset with an enable pin and can be cleared with a digital enable input pin.

See figure 2 illustration on back cover

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>Measurement Range (A)</th>
<th>Voltage (V)</th>
<th>Bandwidth (kHz)</th>
<th>Temperature Ranges</th>
<th>Packages</th>
<th>Features</th>
</tr>
</thead>
</table>
| Hot Swap Controller | ACS761 | ±20                  | 12 to 20    | 50              | E                  | QSOP-24 | • Hall-Effect Hot-swap protection IC  
|                |             |                       |             |                 |                    |         | • 240 VA - True power fault monitor with user set delay  
|                |             |                       |             |                 |                    |         | • Over-current - fault level and delay time set by user  
|                |             |                       |             |                 |                    |         | • Short circuit - 2 us response  
|                |             |                       |             |                 |                    |         | • FET failure detection and alert  
| Hot Swap Controller | ACS760 | ±20                  | 12 to 20    | 50              | E                  | QSOP-24 | • Hall-Effect Hot-swap protection IC  
|                |             |                       |             |                 |                    |         | • 240 VA - True power fault monitor with user set delay  
|                |             |                       |             |                 |                    |         | • Over-current - fault delay time set by user  
|                |             |                       |             |                 |                    |         | • Short circuit - 2 us response  
|                |             |                       |             |                 |                    |         | • PGOOD - output voltage good indicator |

Temperature range codes: S = -20°C to 85°C, E = -40°C to 85°C, K = -40°C to 125°C, L = -40°C to 150°C

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The current sensor IC families are innovative, monolithic, isolated Hall-effect based devices that provide a fully-integrated solution in industry-leading, small-sized packages.

0 to 50 A Integrated Conductor Sensor ICs

Allegro offers a unique solution for current sensing through the development of proprietary packaging that employs flip-chip technology. This technology generates excellent magnetic coupling in a core-less package design and provides up to 3000 V_{RMS} galvanic isolation.

The low-profile, small form factor packages are ideal for reducing PCB area over sense resistor op-amp or bulky current transformer configurations. The low resistance internal conductor allows for sensing up to 50 A continuous current. Allegro’s fully integrated current sensor ICs are factory programmed at end of line testing to maximize device accuracy over temperature and to provide a typical output error of 1%.

See figures 2, 3 and 4 illustrations on back cover

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>Measurement Range (A)</th>
<th>Isolation Voltage (V_{RMS})</th>
<th>Bandwidth (kHz)</th>
<th>Vcc (V)</th>
<th>Temperature Ranges</th>
<th>Packages</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidirectional</td>
<td>ACS709</td>
<td>±12 to 75</td>
<td>2100</td>
<td>120</td>
<td>3.3, 5</td>
<td>L</td>
<td>QSOP-24</td>
<td>Automotive grade high bandwidth, fast fault response current sensor IC in thermally enhanced package</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>ACS710</td>
<td>±12 to 75</td>
<td>3000</td>
<td>120</td>
<td>5</td>
<td>K</td>
<td>SOIC-16</td>
<td>High bandwidth, fast fault response current sensor IC in thermally enhanced package</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>ACS711</td>
<td>±12.5 to 25</td>
<td>&lt;100 VDC</td>
<td>100</td>
<td>3.3</td>
<td>E, K</td>
<td>QFN-8</td>
<td>A 30-amp current sensor IC available in a 3 mm x 3 mm QFN package or an SOIC-8 package. Integrated fault output, economic low voltage isolation, low noise, 3.3 V operation with high bandwidth</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>ACS712</td>
<td>±5 to 30</td>
<td>2100</td>
<td>80</td>
<td>5</td>
<td>E</td>
<td>SOIC-8</td>
<td>Low noise, fast response, shielded current sensor IC</td>
</tr>
<tr>
<td>Unidirectional</td>
<td>ACS713</td>
<td>20 to 30</td>
<td>2100</td>
<td>80</td>
<td>5</td>
<td>E</td>
<td>SOIC-8</td>
<td>Unidirectional version of ACS712</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>ACS714</td>
<td>±5 to 30</td>
<td>2100</td>
<td>80</td>
<td>5</td>
<td>E, L</td>
<td>SOIC-8</td>
<td>Low noise, high speed current sensor IC with integrated shield; automotive grade</td>
</tr>
<tr>
<td>Unidirectional</td>
<td>ACS715</td>
<td>20 to 30</td>
<td>2100</td>
<td>80</td>
<td>5</td>
<td>E, L</td>
<td>SOIC-8</td>
<td>Unidirectional version of ACS714 - automotive grade</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>ACS716</td>
<td>±12.5 to 25</td>
<td>3000</td>
<td>120</td>
<td>3.3</td>
<td>K</td>
<td>SOIC-16</td>
<td>High bandwidth, fast fault response current sensor IC in thermally enhanced package</td>
</tr>
</tbody>
</table>

Temperature range codes: S = -20°C to 85°C, E = -40°C to 85°C, K = -40°C to 125°C, L = -40°C to 150°C

50 to 200 A Integrated Conductor Sensor ICs

The Allegro ‘CA’ and ‘CB’ package current sensor ICs are fully integrated current sensor solutions. They contain the primary conductor, concentrating ferromagnetic core and the analog output Hall-effect linear IC in a single package. The conductor resistance is a typical of 100 µΩ for ultra low power loss when sensing current up to 200 A. These sensors are automotive grade devices that can take the heat and deliver highly accurate open loop current sensing in the most harsh application environments.

The Allegro medium current devices are much smaller than bulky current transformers and have the added advantage of sensing both AC and DC currents. The package design also provides galvanic isolation to 4800 V_{RMS} and can be used in many line side applications.

See figure 5 illustration on back cover

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>Measurement Range (A)</th>
<th>Isolation Voltage (V_{RMS})</th>
<th>Bandwidth (kHz)</th>
<th>Vcc (V)</th>
<th>Temperature Ranges</th>
<th>Packages</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidirectional</td>
<td>ACS756</td>
<td>±50 to 100</td>
<td>3000</td>
<td>120</td>
<td>5</td>
<td>S, K</td>
<td>CA</td>
<td>High bandwidth current sensor IC for monitoring currents from 50 to 100 A</td>
</tr>
<tr>
<td>Uni/Bidirectional</td>
<td>ACS758</td>
<td>±50 to 200</td>
<td>4800</td>
<td>120</td>
<td>5</td>
<td>E, K, L</td>
<td>CB</td>
<td>Thermally enhanced, high bandwidth current sensor IC for monitoring currents from 50 to 200 A</td>
</tr>
<tr>
<td>Bidirectional</td>
<td>ACS759</td>
<td>±50 to 200</td>
<td>4800</td>
<td>120</td>
<td>3.3</td>
<td>E, K, L</td>
<td>CB</td>
<td>Thermally enhanced, high bandwidth current sensor IC for monitoring currents from 50 to 200 A</td>
</tr>
</tbody>
</table>

Temperature range codes: S = -20°C to 85°C, E = -40°C to 85°C, K = -40°C to 125°C, L = -40°C to 150°C
Small Form Factor, High Bandwidth Hall-Effect Sensor IC Solutions

Key Features

- Low insertion loss; power dissipation much less than shunt solution
- Able to monitor both AC and DC currents
- 5 V or 3.3 V, single supply operation
- Voltage isolation rating certified by UL and TUV America
- Smaller form factor than shunt and current transformer solutions
- RoHS compliant

Figure 1: SIP Package
Figure 2: QSOP-24 Package
Figure 3: SOIC-16 Package
Figure 4: SOIC-8 Package
Figure 5: CA/CB Package

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